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Wayne A. Reinsch and H. A. Curwen Discuss Western Metal Congress Program

(See p. 7)

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February, 1961

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METALS REVIEW

The News Digest Magazine

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- **Influence of Delta-Ferrite-Carbide Segregates on the Mechanical Properties of Modified 12% Chromium Steel. Loria, Climax Molybdenum Co.**
- **Shear Deformation of Magnesium and Zinc Crystals. Phillips, E. I. Du Pont.**
- **Effect of Stress Decreases on the Creep of Aluminum in the Dislocation Climb Region. Raymond Ludemann, Dorn, U. of California.**
- **Investigation of the Intermediate Temperature Ductility Minimum in Metals. Rhines, Wray, U. of Florida.**
- **The Effect of Oxygen on the Properties of Zircaloy-2, Rubenstein, Shubert, Goodwin, Westinghouse Bettis.**
- **The Effect of Prestraining and Retempering on AISI 4340. Stephenson, MIT. Cohen, Bethlehem Steel Co.**
- **Effects of Surface Condition on the Mechanical Properties of Beryllium Sheet. Matthews, Jacobson, Lockheed Aircraft Corp. Ward, International Nickel Co.**
- **Direct Reduction of Ferric Oxide by Solid Carbon in Vacuum. Yun, Argonne National Laboratory.**
- **Constitution Studies of the Indium-Rich Portion of the System Antimony-Bismuth-Indium. Peretti, U. of Notre Dame.**
- **Constitution and Transformation Behavior of the Ti-8A1-8Zr-1 (Ta-Cb) Alloy. Margolin, New York University. Ence, Republic Aviation Corp.**
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METALS REVIEW

The News Digest Magazine

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Contents

Announce Four Top ASM Staff Appointments 5
Western Metal Congress Promises Ideas for Productivity Boom 7

Western Metal Congress Technical Programs

American Society for Metals 9
Society for Nondestructive Testing 9
American Institute of Mining, Metallurgical and Petroleum Engineers 10
American Society for Testing Materials 11
Society of Aerospace Material and Process Engineers 11
Aerospace Briefing Sessions, U.S. Air Force 11

Congress Papers to Appear in New ASM Quarterly 8
Metallurgical Round Tables, by R. H. Gassner 12
ASM Presents $30,500 in College Scholarships 13

Important Lectures

Impact Machining, by W. W. Wishart 14
Heat Treating Rocket Cases, by N. O. Kates 14
Rare Earth Structure Studies, by A. H. Daane 14
Continuous Casting, by Neils Engel 15
Materials in the Nuclear Age, by William Manly 16
Production of Corvairs, by E. H. Kelley 16
Copper Alloys, by R. V. Severson 17
Communications Among Workers, by L. O. Gilbert 18
Ductile and Brittle Fracture Research, by G. M. Sinclair 19
Electron Microscopy, by R. P. Sernka 19
Canadian Materials Research, by Harold Oatway 20
Aluminum in Auto Engines, by R. M. Smith 21
Advantages of Cast Steel, by J. J. Henry 21
Aircraft Industry Demands Strong Steels, by A. J. Lena 22
Low-Temperature Studies, by Maxwell Gensamer 24

Departments

Editor's Page 4
Chapter Briefs 6
Technical and Regional Meetings 14
Chapter Calendar 23
Employment Service Bureau 24
3-Minute Glass 26

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The Editor's Page

Another Debut

As promised here last month, a new columnist appears in this issue of *Metals Review*. If you will turn to the page opposite the inside back cover, you will find an interesting message from Allan Ray Putnam. His comment will appear there monthly under the heading "The Three Minute Glass".

Those of you who have attended ASM chapter meetings at which our managing director has talked have probably been intrigued by his constant companion on those occasions—a giant timing instrument. It is known as a twenty-minute glass for the obvious reason that it measures one-third of an hour.

The twenty-minute glass is of more than ordinary value to its owner because it represents the thoughtfulness of Past President Clarence Lorig. Dr. Lorig hand fashioned the device and presented it to Ray Putnam several months after the latter had casually stated he would like to have some such trademark to serve as a reminder at any event where time is at a premium and talk is prevalent.

Chapter Personalities

Speaking of chapter meetings, by now more than half of our 115 chapters in the United States and Canada have been visited by ASM officers or staff—sometimes both.

To many of these people, and I am certainly no exception, one of the fascinations of visiting chapters is opportunity of observing the varied personalities of the chapters. If one tried, it would probably be impossible to draw an accurate composite picture of a typical chapter.

One observation can be made. Size alone is no indication of the vitality of a chapter. Some of our smaller chapters have a spirit that could and should be envied by the larger groups. In the smaller chapters which come to mind, there is usually a true sense of friendship and common purpose which is difficult to find in large groups.

Off We Go

There appears to be no end to the activities indulged in by chapters. The most imaginative idea encountered recently came to light on a recent visit to the Pittsburgh Chapter. A special activities group of ASM's largest chapter (2080) is investigating the possibility of sponsoring an air tour of Europe next fall. It will be interesting to see how many members sign up.

Pardon Our Pun

Although no promise against using puns in this space was made or implied, we are a bit hesitant about the following. At any rate to clear the thought from my mind, I'll risk an anguished shudder or two. To me there could not have been a more apt choice of an individual for an executive post with this technical society than ASM's Director of Administrative Services and Finance. His name is Albert L. Lloyd. The aptness of his selection becomes more apparent when one uses his initials or nickname—A. Lloyd or Al Lloyd. It's an unalloyed pleasure to introduce him.

Definitions

Not the least of the valuable things to be found in your new Metals Handbook is the lengthy section on definitions pertinent to metallurgy and metalworking. In there you will find a definition of the word "metallurgist". Although many brains spent many hours agreeing upon this definition it is reasonable to assume that the search for an ideal definition will go on with scarcely any slackening of pace.

Several ASM committees are awaiting what they consider to be the ultimate in definitions. How they will approach many of the problems facing them depends on a precise but at the same time an all-encompassing definition.

All suggestions are welcomed.

T. C. DuMond

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FOUR TOP ASM STAFF APPOINTMENTS DESIGNED TO IMPROVE SERVICES TO 33,176 SOCIETY MEMBERS

By ALLAN RAY PUTNAM
Managing Director, American Society for Metals

In his Annual Report to the Society for the past year's activity, Walter Crafts, our immediate past president, points to American Society for Metals' importance as part of an expanding universe and calls for members and staff associates of the Society to accept the responsibility toward an expanding usefulness for ASM.

It is in recognition of this spirit that I report to you, the members of ASM who are most significantly affected, of the appointment of Ted C. DuMond, A. P. Ford, Albert L. Lloyd and Ernest E. Thum to positions that will help provide the mechanisms by which we can meet our responsibilities to our members and our industry.

DuMond will be director of chapter and member relations; Ford, director of communications; Lloyd, director of administrative services and finance, and Thum, director of editorial services. The mainstreams of Society activity are now the immediate concern of these four directors. Together with the ASM national committees and the great body of ASM members, these men will work toward a continually improving scope of service to our members in every field of materials and process engineering.

The service areas of these four directors are highly interdependent. In every case, the activities of one could not exist without the others. This action has been taken not to divide responsibility, but to coordinate it along principles representing the latest and best thinking of modern management. In this is recognized the expanding educational role of ASM in the years ahead, and the best means of implementing the carrying out of the Society's responsibilities.

As director of chapter and member relations, DuMond will coordinate ASM services to its 33,176 members, 115 chapters and 19 student groups, and will in effect be the ASM member's personal emissary at Metals Park. This year alone he will have visited more than 80 chapters, attending meetings and counseling with officers. He will be striving to achieve the highest degree of two-way interaction between the national organization and the chapters.

He will be constantly representing the viewpoint of the individual member in any situation respecting policy, plans or administrative detail of the Society. One of the ASM's most active staff associates, he also is manager of national and regional Metal Congresses, in which activity he coordinates the technical sessions and speakers activities. He works closely with other technical societies cooperating with ASM in the dissemination of information. His diversfied background includes engineering, newspaper reporting, advertising, public relations and technical editing.

As director of communications, Ford will be responsible for the business management of all communications media of the Society, including periodical and reference publications, national and regional expositions, ASM advertising and public relations. Reporting to him will be the exposition manager, advertising manager and news bureau manager. He will be charged with communicating ASM services to industry. And since support of the educational services of the

T. C. DuMond

A. L. Lloyd

E. E. Thum

A. P. Ford

Society to its members are entirely dependent upon its revenue-producing activities, the success of Ford's activities as director of communications is prerequisite to ASM's continued growth.

As director of administrative services and finance, Lloyd will supervise internal administrative activities at ASM headquarters and will be concerned with the financial management of the Society. In cooperation with other directors, he will develop operating budgets for the various ASM departments. Reporting to him will be the assistant treasurer and manager of accounting, manager of production and printing, manager of membership records and data processing, and the building superintendent. He also will manage the personnel and purchasing departments.

As director of editorial services, Thum will coordinate the editorial goals, staff and the editorial content of all Society periodicals and reference publications. One of his objectives will be the continuing improvement of the over-all concept of ASM publications and their relationship to each other. Reporting to him will be an editor of periodical publications who will have general editorial supervision of *Metal Progress, Metals Review* and the new quarterlies of the Society. Also reporting to Thum will be an editor of reference publications who will supervise editorial work in the ASM Metals Handbook and all other technical and reference books.

Thum holds Honorary Membership in ASM, a recognition of achievement that has been conferred by the Society only 24 times in its 48-year history. From a principal associate editorship of *Iron Age,* he was called upon in 1930 to become the editor of a new magazine embodying new concepts in technical publications, one that would be exclusive in its field, authoritative and typographically outstanding. The magazine, of course, was *Metal Progress,* a primary source of information for the ASM member today. In 1957 he was made editor-in-chief.

Five Round Table Discussions Feature Chicago Meeting

Five simultaneous round table discussions on heat treatment were held at a recent meeting of the **Chicago** Chapter covering steels, nonferrous metals and methods.

R. H. Boettger, Columbia Tool Steel Co., led a discussion on "Heat Treatment of Toolsteels". Attention was called to the ever-increasing demand for dimensional accuracy in tools and dies. He pointed out the effect of hardening, toughness and effect of mass. It was emphasized that there is a best hardening and tempering temperature for a given tool or die. Other high points discussed were temperature and atmosphere control, grinding and proper design to eliminate stress concentrations and give the tool or die a balanced section.

J. S. Orlando, H. M. Harper Co., was the discussion leader on "Heat Treatment of Nonferrous Metals". He gave a short dissertation on the most common nonferrous alloys in service today. Within recent years there have been great gains in the use of nonferrous metals in certain applications. Wider ranges of mechanical properties can be achieved in the precipitation-type hardening alloys. General problems were also discussed and recommendations made. Materials for aircraft use were discussed at great length, particularly heat treatment required to develop specific physical properties.

E. L. Kemper of Lindberg Engineering Co. headed the session on "Salt Bath Heat Treatment". This group dealt primarily with problems encountered, such as maintenance of bath neutrality; equipment and salt chemistry. Electrode construction and design, and various metallurgical factors, such as decarburization, growth and surface attack by undesirable elements were discussed. The participants who presented problems were offered possible solutions by other members of the group.

M. R. Scott of the Detroit Flame Hardening Co. led the group on "Selective Hardening by Flame and Induction". Emphasis was placed on the relative positions enjoyed by each of the selective hardening methods in the treating of metals. Comparisons were made between power and gas requirements, equipment costs and, in particular, the range of work sizes which could be adapted to each process. Selection of materials for heat treatment by various processes is being given prime consideration in the early stages of design of machine components.

The discussion on "Gas Carburizing and Carbonitriding" was led by G. P. Davis of Warner Gear Division, Borg-Warner. He opened the session with a brief résumé of the current practice in this work. Participants discussed problems such as selection of the particular process for a given application, the proper case depth and case chemistry for these applications. Also under discussion were the various modes of carburizing, such as pack, liquid and gaseous carburizing. Problems associated with each of these processes were discussed and solutions suggested. *(Reported by W. L. Meinhart).*

CHAPTER BRIEFS

- Approximately 130 members and guests of the **Upper Ohio Valley** Chapter attended that group's first "Winter Festival".
- Color slides of welding techniques in Holland, France and Germany helped in the presentation of the talk "Advances in Welding in Europe and Russia" before the **Canton-Massilon** Chapter presented by Clarence E. Jackson, Associate manager, Newark Development Laboratory, Linde Co.
- "Railroading in the USSR" was the subject of a talk before the **Rocky Mountain** Chapter by W. M. Keller, vice-president of research, Association of American Railroads.
- The history of Bethlehem Steel Co.'s Sparrows Point, Md., plant was traced for the **Baltimore** Chapter by Julian Murray Spencer, chief engineer at that plant. Since 1916 capacity of the plant has increased from 700,000 ingot tons to 8,200,000 ingot tons per year.

Western Metal Show Promises Ideas for Productivity Boom

ASM members everywhere are following preparations for the "Idea Center for Industry West," 12th Western Metal Show, with great interest. Coming up Mar. 20-24, 1961, in Los Angeles, the combined Congress and Exposition comprise a regional event of international scope and significance.

"Presentation of this dual event is well timed," says Allan Ray Putnam, managing director of the sponsoring American Society for Metals. "Metalworking in the West and, indeed, the entire nation, is now on the threshold of an unparalleled period of expansion. Ideas are urgently needed to help western industry meet the productivity challenges ahead. The Metal Show is designed to meet this need for ideas".

The Western Metal Congress in Ambassador Hotel will include a larger and more comprehensive series of technical sessions than ever before in the event's 32-year history. More than 100 timely papers will be presented in 32 sessions by members of American Society for Metals and seven other engineering organizations.

Chester L. Wells, manager of ASM Expositions, predicted more than 200 exhibits for the Western Metal Exposition in Pan-Pacific Auditorium and adjoining Pavilion. ASM members, he said, will find the displays of particular interest this year, as exhibitors report renewed emphasis on educational aspects of their exhibits.

T. C. Du Mond, manager of ASM Metal Congresses, points to the technical sessions as a prime example of the Society's basic aim—members giving of their knowledge and experience to benefit the entire Society and the industry it serves. Du Mond met recently to finalize plans with the Western Metal Show Host Committee in Los Angeles, handling local arrangements for the event. The committee is headed by H. A. Curwen, technical director, Earle M. Jorgensen Co., as Convention chairman; and Los Angeles Chapter Chairman William V. Ward, International Nickel Co., as Congress general chairman.

Seven Societies Present Useful Idea Sessions

At this conference, six engineering groups that will present technical programs in addition to ASM were announced. They include the U.S. Air Force, Metallurgical Society AIME, Aerospace Corp., American Society for Testing Materials, Society for Nondestructive Testing and Society of Aerospace Materials and Process Engineers.

Wayne A. Reinsch, program chairman of the Host Committee, reported the eight technical sessions comprising the ASM Western Engineering Conference will be a "Technical Idea Center" on the topics Metals Research, Process Metallurgy, Value Engineering, Laboratory Methods, Heat Treating and Advanced Design and Melting. He is senior research engineer for North American Aviation.

No Charge to ASM Members

ASM technical sessions are free and open to all members and friends of the Society. The exposition will likewise be free to holders of ASM admission-invitations, which are being distributed to members of all western sections of ASM and more than 40 cooperating technical societies. ASM members who do not receive admission-invitations through the mail are advised to request one from one of their suppliers who are exhibiting in the Metal Exposition. Admission-invitations entitle their holders to register for all five days of the Metal Show at no charge.

ASM members will be interested in the new system of registrations they will find at the Western Metal Show. For the first time in any western exposition, ASM will provide each visitor with the exclusive new "Informa-Badge", a plastic plate that looks like a "credit card", imprinted with the visitor's name, title, company and address. The plate slips into a transparent

FINAL PLANS DISCUSSED—*Final program details for the 12th Western Metal Congress and Exposition, Mar. 20-24, in Los Angeles, are the subject of this informal gathering. From left are: T. C. DuMond, manager of ASM Metal Congresses; John E. Wilson, cooperating societies chairman; Donald E. Roda, publicity chairman; and Fred H. Currie, entertainment chairman. The four are pictured at a recent meeting of the Western Metal Show Host Committee in Los Angeles.*

holder for an easy-to-read badge, then slips out for instant recording on imprinting equipment in each exhibit. This feature of the "Informa-Badge" assures fast forwarding of exhibitors' product information to the visitor after the show.

Ideas From Metalworking Experts

Great emphasis has been made in the Exposition on the educational value of talking directly with informed experts in each exhibit—the people who can impart new ideas, demonstrate new products and processes, solve specific metalworking problems. Within the framework of this broad industrial exposition, many educational features will be devoted to fields of immediate interest to the West—aircraft, space vehicles, rockets, missiles and electronics. And staffing these exhibits, for the most part, will be members of ASM—men who understand the educational needs of other members.

Special Air Force Briefing Featured on Western Program

Two special sessions on missile systems and the materials that will be necessary for the United States to meet its objectives will be presented at the Western Metal Congress in Los Angeles. The sessions are scheduled for Monday, Mar. 20 and Tuesday, Mar. 21, at the Ambassador Hotel.

Only those individuals with "secret" clearance will be admitted to the special classified session on Monday which is to be sponsored by the United States Air Force. The session will provide a briefing on advanced missiles systems to spell out for the audience achievement targets established by the Air Force. Clearance form can be secured in advance through the Los Angeles ASM office, 1007 Brockman Bldg., 520 W. Seventh St., Los Angeles 14, Calif.

Under the sponsorship of Aerospace Corp., Los Angeles, the second session will be devoted to four discussions of present and future materials demands and manufacturing techniques related to this country's missiles programs. There are no restrictions on attendance at the materials session.

The two-day program will open with a special ASM luncheon at 12:00 noon Monday, Mar. 20, featuring an address by Major Gen. O. J. Ritland speaking on "Advance Planning and Development Philosophies for Future Weapon Systems".

The special program will be concluded with a luncheon sponsored by the Society for Nondestructive Testing. Speaker for the concluding luncheon will be Major Gen. Thomas P. Gerrity speaking on "The U. S. Air Force Ballistic Missile Silo Activation Program".

A detailed program of the sessions is printed on page 9.

Western Dinner-Dance at Cocoanut Grove

Entertainment Chairman Fred H. Currie, district representative for Trent Tube Co., announces the Western Metal Show Dinner-Dance for Thursday evening, Mar. 23, in the world-famous Cocoanut Grove of the Ambassador Hotel. He is already receiving applications for reservations at $10 each, mailed to his Trent Tube Co. office, Room 201, 1901 W. 8th St., Los Angeles 57.

ASM'ers will find this an enjoyable opportunity to get together, renew old acquaintances and meet new friends amid a sparkling nightlife atmosphere of the Cocoanut Grove, dancing to the music of Freddie Martin and his orchestra, and a condensed version of a famous operetta.

Other Southern California ASM members who will welcome visitors include Edward W. Golda, technical supervisor, Phelps Dodge Copper Products Corp., general vice-chairman; Charles H. Dickson, chief engineer, Alloy Fabricators, Inc., general secretary; Ray E. Huffaker, chief metallurgist, Ladish Pacific Div., general treasurer, E. T. Bergquist, chief metallurgist, Western Gear Corp., arrangements chairman; John E. Wilson, district manager, Climax Molybdenum Co., cooperating societies chairman; Norbert F. Vinatieri, director, Alphatizing, Inc., reception chairman; Wilbur R. Varney, president, Angelus Steel Treating Corp., Young Engineers Day chairman; Donald E. Roda, group leader, materials engineering, Rocketdyne Div. of North American Aviation, publicity chairman.

Mrs. ASM Member to Enjoy California Vacation Paradise in Mid-March

Exciting plans are being made by the Ladies' Entertainment Committee for a fun-filled week of luncheons, tours and visits to high spots of the Southern California vacationland. Mrs. John E. Wilson, chairman, said there will be a variety of interesting things for wives of Metal Show visitors to do while their husbands are attending the exhibits and technical sessions. Members are Mrs. H. A. Curwen, Mrs. Fred H. Currie, Mrs. W. W. Farrar and Mrs. Allan Ray Putnam, wife of the managing director.

Engineering Papers From ASM Congresses in New Quarterly

Important engineering papers from national and regional Metal Congresses now will have a tailor-made medium for publication, according to announcement by Allan Ray Putnam, managing director of American Society for Metals. The *ASM Metals Engineering Quarterly*, he said, will include the outstanding presentations made at the Metals Engineering Program Committee's technical sessions.

The new *Quarterly*, Putnam stated, answers a long-standing need of ASM's technical management members for a convenient and up-to-the-minute collection of these important papers. Previously, only a few of the Metals Engineering Program Committee presentations could be published by ASM through its other publications. The new magazine will differ from *Transactions* in that it will stress practical engineering for immediate application. *Transactions* emphasis is more highly technical.

Putnam concurrently announced the appointment of John Parina as editor of the *Quarterly*. In his tenth year with the editorial staff of American Society for Metals, Parina is editor of technical books and associate editor of *Transactions*. He began his ASM career in 1951 as assistant editor of *Metal Progress*. His prior experience includes an associate editorship of *Steel* magazine.

ASM members now have the opportunity to subscribe to the new publication at $6.00 per year, or 40% under the regular price of $10.00. The *Metals Engineering Quarterly*, in 8½ x 11 in. format, will be issued in February, May, August and November of each year. Binders will be available for the four issues.

TECHNICAL PROGRAM

12th ASM Western Metal Congress and Exposition

Los Angeles, Mar. 20-24

Sessions of interest to everyone will be presented by the American Society for Metals, Society for Nondestructive Testing; American Institute of Mining, Metallurgical, and Petroleum Engineers; American Society for Testing Materials; and the Society of Aerospace Material and Process Engineers. All meetings will be held at the Ambassador Hotel.

American Society For Metals

Mar. 20, Ambassador Ballroom

Mon. 9:00 a.m. Metals Research

Chairman: D. S. Clark
California Institute of Technology

Dislocations . . . E. R. Parker, Univ. of California

Electron Microscopy . . . C. M. Schwartz, Battelle Memorial Institute

Micrometallurgy . . . D. B. Wittry, Univ. of Southern California

Mon. 2:00 p.m. Metals Research

Chairman: G. Bennett
Douglas Aircraft Co.

Crack Propagation . . . G. Sines, U.C.L.A.

Forming Limitations and Plastic Flow . . . W. M. Baldwin, Case Institute of Technology

Stress Corrosion . . . R. B. Robinson, Aerojet-General Corp.

Mar. 21, Ambassador Ballroom

Tues. 9:00 a.m. Process Metallurgy

Chairman: J. F. Baisch
Boeing Airplane Co.

Alloying During Welding . . . G. E. Linnert, Armco Steel Corp.

Electron Beam Melting and Welding . . . E. G. Thompson, Marquardt Corp.

Ultrasonics in Casting . . . D. R. Carnahan, Westinghouse Electric Corp.

Tues. 2:00 p.m. Value Engineering

Panel Chairman: E. D. Heller
Convair Div.

Need for Value Engineering . . . E. D. Heller, Convair Div.

New Approach to Value . . . R. Dombrow, GMC

Value Engineering—a Functional System . . . E. D. Heller, Convair Div.

Examples of Value Engineering . . . R. Hobson, General Electric Co.

Value Engineering in Industry . . . A. R. Tocco, Hughes Aircraft Co.

Mar. 22, Ambassador Ballroom

Wed. 9:00 a.m. Laboratory Methods

Chairman: A. Hurlich
Convair Astronautics

High-Speed, High-Temperature Testing . . . R. E. Mihalco, Convair, Pomona

Cryogenic Testing . . . R. M. McClintock, National Bureau of Standards

Elevated Temperature Compression Testing . . . J. P. King, North American Aviation

Liquid Metal Testing . . . J. A. Leppard, Atomics International

Wed. 2:00 p.m. Heat Treating Steels and Heat Resistant Alloys

Panel Chairman: G. B. Berlien
Industrial Steel Treating Co.
Co-Chairman: W. C. Anderson
North American Aviation

Equipment . . . O. Cullen, Surface Combustion Co.

Atmospheres . . . W. B. Varney, Angelus Steel Treating Corp.

Coatings . . . E. Stone, Boeing Aerospace Div.

Techniques . . . R. R. Lundquist, California-Doran Heat Treating Co.

Mar. 23, Ambassador Ballroom

Thurs. 9:00 a.m. Metallurgy for Advanced Design

Chairman: R. A. Perkins
Lockheed, Sunnyvale

Refractory Alloys . . . E. D. Weisert, Marquardt Corp.

Welding Refractory Alloys . . . W. R. Young, General Electric Co.

Plasma Jet Coating Techniques . . . H. C. Sullivan, Convair Div.

Thurs. 2:00 p.m. Vacuum and Consumable Electrode Melting

Chairman: S. T. Ross
Ford Motor Co.

Induction Melting . . . I. S. Servi, Kelsey-Hayes Co.

Consumable Electrode Melting . . . T. E. Perry, Republic Steel Corp.

Rocket Case Applications . . . J. A. Brown, Aerojet-General Corp.

The Forger's Viewpoint . . . J. Luchok, Wyman-Gordon Co.

Society for Nondestructive Testing

Mar. 20, Venetian Room

Mon. 9:00 a.m. Testing Rockets and Missiles

Chairman: J. W. Morris
Douglas Aircraft Co.
Co-Chairman: R. Reynolds
Eastman Kodak Co.

The Lie of Reliability . . . K. A. Skeie, Magnaflux Corp.

Radiography of Solid Propellants With Linear-Accelerator Source . . . M. D. Philips, Thiokol Chemical Corp.

Differential Radiological Inspection Systems . . . D. L. Dye, Boeing

Radiological Inspection of Solid-Propellant Rocket Motors . . . D. R. Lunney, Boeing Airplane Co.

Mon. 1:30 p.m. Testing Rockets and Missiles

Chairman: J. W. Morris
Douglas Aircraft Co.
Co-Chairman: R. Reynolds
Eastman Kodak Co.

A Survey—Testing of Solid-Propellant Rocket Motors . . . A. Barath and D. J. Hagemaier, Douglas Aircraft Co.

Ultrasonic Evaluation of Bond Integrity on Missile Components . . . W. C. Hitt, Automation Industries, and R. R. Rowand, Wright-Patterson Air Force Base

Magnetic Particle Testing of Fuel Cases . . . A. E. Christensen, Magnaflux Corp.

Ultrasonic Inspection of Liquid-Propellant Rocket Motors . . . R. E. Kleint and C. M. Johnson, North American Aviation

Mar. 21, Venetian Room

Tues. 9:00 a.m. Testing of Electronic Components

Chairman: P. Dick
General Electric Co.
Co-Chairman: J. L. Coburn
Lockheed Missile Div.

Systems Testing . . . W. W. Heil, General Electric Co.

Correlation Between Nondestructive and Destructive Tests . . . D. D. Seltzer, Martin Co.

Capacitor Resistance and Absorption Testing . . . H. S. Endicott, General Electric Co.

Radiography and Polarographic Testing . . . S. DiLauro and F. P. Kiefer, Sperry Gyroscope Co.

Electrical and Mechanical Effects of Transducer Design . . . J. Bacon, Elion Ultrasonics, Inc.

Tues. 9:00 a.m. Panel on Isotopes in Industry

Moderator: G. H. Tenney,
Los Alamos Scientific Lab.

Panel Members:
C. R. Buchanan, Atomic Energy Comm.
C. W. Buckland, Jr., Los Alamos Scientific Lab.
J. Hall, Budd Co.
G. R. Forrer, Babcock & Wilcox Co.
W. H. Hannah, Puget Sound Shipyard
G. A. Blanc, A.E.C.

Tues. 1:30 p.m. Lester Honor Lecture

High - Energy Nuclear Radiations. Their Implications for Industry . . . E. Alfred Burrill, High Voltage Engineering Corp.
DuPont Award: G. R. Forrer Babcock & Wilcox Co.

Mar. 22, Venetian Room

Wed. 9:00 a.m. Testing in the Aircraft Industry

Chairman: W. C. Hitt Automation Industries
Co-Chairman: R. J. Curry Federal Aviation Agency

Aircraft Reliability . . . N. Barber, United Air Lines
A New Technique in Aircraft Radiography . . . G. R. Bailey, Convair Div.
Testing at Lockheed . . . E. Searles, Lockheed Aircraft Co.
Testing in the Field . . . J. Morris, Douglas Aircraft Co.
Testing at Boeing . . . J. N. Paulson, Boeing Airplane Co.

Wed. 9:00 a.m. Testing in the Oil Industry

Chairman: W. P. Field Union Oil Co.
Co-Chairman: R. Loper Standard Oil

Radiographic Inspection of Refinery Pipelines . . . J. Wooton, Southern California Gas Co.
Determination of Wall Thickness on Refinery Piping by Radiography . . . G. L. Weber, Oil Field Inspection Service Co.
Hot Line on Stream Inspection by Pulse Echo Ultrasonics . . . J. R. Richards, International Inspection Inc.
Testing Oil Field Equipment . . . P. W. Hill, Signal Oil & Gas Co.

Mar. 22, Venetian Room

Wed. 1:30 p.m. Selective Testing Means Savings

Chairman: M. J. Curtis Naval Ordnance Test Station
Co-Chairman: J. L. Duss A.C.F. Industries, Inc.

Testing Reinforced Plastics and Ceramics . . . C. H. Hastings, Avco Corp.
Testing Reinforced Plastics and Resin Ceramic Composites . . . L. C. Lynworth, Avco Corp.
High-Energy Radiographic Shielding . . . E. L. Criscuolo, Naval Ordnance Lab.
High-Voltage Calibration in Industrial X-Ray Apparatus . . . M. V. Marschal, Balteau Electric
Testing in Heavy Manufacturing, a Cost Reduction and Quality Improvement Tool . . . M. A. Davis, Westinghouse Electric

Wed. 1:30 p.m. Nuclear Developments in Testing

Chairman: R. B. Socky General Electric Co.
Co-Chairman: L. Goodman Atomics International

Contribution of Atomic Energy . . . P. C. Aebersold, AEC
Nuclear Quality Standards and Specifications . . . W. J. McGonnagle, Argonne National Lab.
Lamb-Wave Thickness Gage . . . C. L. Frederick, General Electric Co.
Justification of Testing in Aircraft Nuclear Propulsion . . . A. E. Focke, General Electric
Economic Justification of Testing Requirements in the Atomic Industry . . . T. C. Lambert, General Electric

Mar. 23, Venetian Room

Thurs. 9:00 a.m. Testing in the Shipbuilding Industry

Chairman: W. H. Hannah Puget Sound Naval Shipyard
Co-Chairman: J. Hall Budd Co.

Measurements of Material Characteristics . . . K. A. Skeie, Magnaflux Corp.
Evaluation of Materials for Nuclear-

A WELL-PLANNED WELCOME—*The 12th Western Metal Show, Mar. 20-24 in Los Angeles, is the topic at a recent meeting of the event's Host Committee, composed of ASM members in Southern California. Clockwise from left foreground are Wilbur R. Varney, Young Engineers Day chairman; Donald E. Roda, publicity chairman; John E. Wilson, cooperating societies chairman; Fred H. Currie, entertainment chairman; Norbert F. Vinatieri, reception chairman; Edward W. Golda, general vice-chairman; John Houston, cooperating societies committee; Ray E. Huffaker, general treasurer; H. A. Curwen, conference chairman; E. T. Bergquist, arrangements chairman; and Wayne A. Reinsch, technical program chairman. Other committeemen are Wm. V. Ward, Chas. H. Dickson, general chairman and secretary.*

Powered Submarines . . . A. M. Garland and H. E. Cossin, Mare Island Shipyard

Eddy Current Testing of Ferrous Tubing . . . R. Hochschild, Budd Co.

Radiography of Cast Nuclear Components With Cobalt Sources . . . C. Lindgren, Pacific Valves Co.

Thurs. 1:30 p.m. Selective Testing Means Savings

Chairman: E. C. Cauthen
Convair Div.
Co-Chairman: E. C. Bennett, Northrup

Wonderful World of Reliability . . . B. J. Cunningham, Minneapolis-Honeywell

Radiographic Correlation of Cast High-Temperature Alloys Using Constant High-Tension Equipment . . . W. F. Alderson, Mektrol Labs.

Radiographic Inspection Procedures for Welded Highway Bridges . . . D. Berger, Oregon Dept. of Highways

Radiography of High-Voltage Power-Line Conductors . . . M. B. Elton, Bonneville Power Adm.

Quality Control in a Foundry . . . L. Venne and W. Halverson, Electric Steel Foundry

Recent Progress in Hi-Speed Radiography . . . W. P. Dyke and S. J. Grundhauser, Field Emission Corp.

Mar. 24, Venetian Room

Fri. 9:00 a.m. Educational Clinic

Technical Chairman: R. B. Moyer
Carpenter Steel
Chairman: D. W. Ballard
Sandia Corp.

Welcome . . . R. B. Oliver, President

Orientation, Scope of Present SNT Field . . . D. W. Ballard, Sandia Corp.

Radiography Including Isotope Radiography . . . W. D. Keihle, Eastman Kodak

Fluoroscopy . . . R. F. Holste, X-Ray Products Corp.

Magnetic Particle Inspection . . . R. G. Strother, Magnaflux Corp.

Leak Detection Methods . . . J. G. King, Sandia Corp.

Fri. 1:30 p.m. Eudcational Clinic

Technical Chairman: J. F. Torbert
Los Alamos Scientific Lab.

Ultrasonic Theory . . . J. Bobin, Branson Instruments

Utrasonics Application and Interpretation . . . R. D. McKowan, Automation Ind.

Eddy Current Test Methods . . . R. Hochschild, Budd Instrument Div.

Penetrant Inspection . . . R. Turner, Magnaflux Corp.

American Institute of Mining, Metallurgical and Petroleum Engineers

Mar. 21, Sunset Room

Tues. 2:00 p.m. Materials at Their Highest Strength—Whiskers

Chairman: G. A. Hoffman
The Rand Corp.

Whiskers in Composites . . . S. S. Brenner, General Electric Co.

Size Effects in Ultra-Strength Materials . . . P. J. Shlichta, Jet Propulsion Lab.

(Title of paper to be announced) . . . B. Daniel, Midwest Research Institute

(Title of paper to be announced) . . . H. Weik, Wright Air Development Div.

(Title of paper to be announced) . . . R. Bacon, National Carbon Research Lab.

Mar. 22, Sunset Room

Wed. 9:00 a.m. Vacuum Thin-Film Metallurgy

Chairman: R. E. Frazer
Jet Propulsion Lab.

Metallurgy, Structure and Application of Thin Films . . . G. Steele, Servo Mechanisms

Magnetic Thin Films . . . F. Humphrey, Jet Propulsion Lab.

Electron Microscopy, X-Ray Diffraction and X-Ray Spectroscopy . . . R. Sloan, Sloan Research Industries

Thin Films as Corrosion Indicators . . . D. Roller, Magna Products

Wed. 2:00 p.m. Properties of Refractory Alloys

Chairman: E. L. Harmon
Jet Propulsion Lab.

Tantalum Alloys . . . F. F. Schmidt, D. J. Maykuth and H. R. Ogden, Battelle Memorial Institute

Oxidation of Tungsten . . . R. A. Perkins, Lockheed Missile and Space Div.

Dispersion Strengthening of Molybdenum . . . W. V. Green and T. J. Ready, Los Alamos Scientific Lab.

Tungsten - Columbium - Tantalum Alloys . . . C. R. McKinsey and J. L. Wilson, Union Carbide Metals Co.

Welding of Molybdenum Tail Pipe for Supersonic Ramjet (color movie) . . . E. Thompson, Marquardt Corp.

Mar. 23, Sunset Room

Thurs. 9:00 a.m. Plasma Arc Applications

Chairman: J. L. Goheen
Plasmakote Corp.

Metallurgical Applications for Plasma Arc . . . J. Winzeler, Plasmadyne Corp.

Process Variables in Plasma Jet Spraying . . . Mash, Weare and Wagner, Advanced Technology Lab.

Spraying of Toxic and Oxidizable Materials . . . A. R. Stetson and C. A. Hauck, Solar Aircraft Co.

Erosion and Corrosion Service . . . G. D. Smith, DuPont Co.

American Society for Testing Materials

Mar. 22, Boulevard Room

Wed. 9:00 a.m. Effect of Conditioning or Processing on Fatigue of Metals

Chairman: R. E. Paine
Aluminum Co. of America

Mechanical Surface Prestressing of Aluminum . . . G. A. Butz and J. O. Lyst, Aluminum Co. of America

Crack Propagation and Fatigue in Steel . . . H. O. Fuchs, Metal Improvement Co.

Master Fatigue Curves . . . G. E. Bockrath and R. H. Christensen, Douglas Aircraft

Society of Aerospace Material and Process Engineers

Mar. 23, Boulevard Room

Thurs. 8:45 a.m. Systems and Design Problems

Chairman: G. E. Williams
North American Aviation

Materials System Program . . . A. P. Binsacca, Northrup Corp.

Metallic Materials for Space Vehicles . . . M. Tiktinsky and G. G. Wald, Lockheed

Composite Materials in Hypersonic Flight . . . S. R. Locke, D. L. Robbins, S. Brelant and V. M. Vila, Aerojet-General

Correlation of Mechanical Test Results With Material Behavior in Structures . . . W. J. Anderson, Atomics International

Thurs. 1:30 p.m. R. & D. on Space Vehicle Materials

Chairman: J. E. Seymour
Northrup Corp.

Properties of Pyrolytic Graphite to 5000°F. . . . W. V. Kotlensky and H. E. Martens, Jet Propulsion Lab.

Prestressed Ceramics . . . J. Rebman and T. J. Stapleton, Lockheed Aircraft

Effect of Environment on Deformation and Fracture in Ceramics . . . J. F. Young, Douglas Aircraft Co.

Refractory Material Composites . . . A. V. Levy and H. Leggett, Hughes Aircraft

Aerospace Briefing Sessions, U.S. Air Force

Mar. 20, Sunset Room

Mon. 2:00 p.m. Advanced Systems Briefing (Attendance restricted to individuals securing Air Force security clearance)

Chairman: Lt. Col. J. F. Clyde
USAF

Future Missile Systems . . . Col. N. M. Lulejian, USAF

Air Force Space Systems Under Development . . . Col. R. W. Hoffman, USAF

Advanced Plans for Space Systems . . . Lt. Col. C. G. Strathy, USAF

Mar. 21, Sunset Room

Tues. 9:00 a.m. Aerospace Materials Session (Open Session)

Chairman: C. W. Sherwin
Aerospace Corp.

Developments in Aerospace Materials . . . L. E. Gatzek, Aerospace Corp.

Advances in Refractory Metals . . . N. E. Promisel, U.S. Navy Bureau of Weapons

Manufacturing Methods—the Keystone to Progress . . . Col. P. L. Hill, Wright Air Development Div.

High-Strength Metals in Aerospace Propulsion . . . W. J. Harris, National Academy of Sciences

Metallurgical Round Tables Solve L. A. Meeting Need

**Mr. Gassner is Chief Metallurgist, El Segundo Div., Douglas Aircraft Co., and Ass't. Sec., Los Angeles Chapter, ASM.*

by R. H. Gassner*

Several years ago, a committee of metallurgists from West Coast airframe companies was formed to establish a cooperative surveillance system for heat treating vendors. During the process of reaching agreement on periodic testing requirements and time, temperature, atmosphere and conditions, some wonderfully stimulating discussions took place. The enlightening character of these discussions was unique because they afforded the participants an unusual opportunity to explore the premises and deductive reasoning behind each other's conclusions. The value of this type of information exchange was so apparent to some of the metallurgists involved that they decided to seek a means by which they could share such experiences with others on a broader range of subjects.

At about the same time, the executive committee of the Los Angeles Chapter ASM recognized that the increasingly diverse interests of the members necessitated a change in the modus operandi. Since only one or two of the regular monthly meetings of each season could be focused on the needs of any particular interest group, the need for supplementary coverage became obvious. Furthermore, those members whose purpose in attending regular monthly dinner meetings was chiefly social were dissatisfied whenever the speaker's topic was moderately technical. On the other hand, those seeking a technical program were equally dissatisfied when a more general topic was presented.

These were the stimuli which brought about the initiation of the Los Angeles Chapter's Metallurgical Round Table Program. In their fourth year now, this series of non-dinner meetings has proved eminently successful from the start. To members wishing to express themselves on any one of a variety of technical subjects, they have provided an ideal outlet. Others who came only to listen to an instructive debate among their more loquacious colleagues, have often found themselves drawn into the vortex of the controversy; the desire to exchange ideas and opinions on such subjects as "Decarb—Friend or Foe?" and "Vacuum Melted Steels" usually becomes contagious. As a corollary to the Round Table Program, there has been a significant trend toward more general subjects at the regular monthly dinner meetings—a gratifying trend to those primarily seeking the social and fellowship values of the Society.

As the above indicates, the Round Table meetings were organized to parallel the earlier heat treat surveillance meetings as closely as possible, but on an expanded scale. Although informality and spontaneity are keynote ideas, advance notice of the topic and agenda is necessary to allow the attendees time to mull over their views of various aspects of the subject. A moderator is also needed to keep the discussion on the subject, to keep it from lagging and to preserve order. The only other prerequisites are a meeting room, some tables arranged in the form of a hollow square and a couple of rows of chairs around the outside of the square.

How then do we go about organizing a Round Table meeting? Well, first we select a topic—one which is of interest, and at least somewhat controversial, to the particular audience expected to attend. (It should be noted that a topic which might provoke controversy in a college chapter, for example, would likely prove unsatisfactory for a chapter whose members were mainly concerned with heavy industry). Next, we prepare an agenda by breaking down the topic into three or four subtopics and further dividing each of these into three or four elements. (This is not quite as easy as it sounds—it almost requires a rehearsal of the meeting, by the organizing committee, to anticipate all facts of the topic likely to arouse interest.) The agenda serves a double purpose—the obvious one of providing a guide for the moderator and the participants during the meeting, and the not-so-obvious but more important one of stimulating some thoughts on the topic in the minds of the prospective attendees. We believe that, sometime during the few weeks between receipt of the agenda and the meeting date, the members interested in the topic give some conscious thought to the issues which the agenda indicates will rise. During this time, they probably begin to crystallize their opinions or feelings on these issues; further refinement probably occurs subconsciously from then until the meeting.

Probably the most crucial step, from the standpoint of over-all success, is selection of a moderator. He must be skillful in leading the discussion along the agenda path, quickly recognizing when one element has been pretty well exhausted and directing attention to the next. Yet, he must also recognize when the discussion should depart from, or skip parts of, the agenda. He should not interrupt the discussion as long as it flows smoothly among the attendees; they should not even feel it necessary to look to him for recognition before speaking. The more spontaneous and uninhibited the give-and-take across the tables, the more successful the moderator. However, he cannot permit more than one person to talk at a time and, in case of a lag, he has to be ready with a pertinent question directed at the right party. In addition to these attributes, other prerequisites for the moderator include (1) at least a general familiarity with the subject and (2) a genuine interest in the thoughts of others with respect to the subject.

A final preparation which is con-

sidered necessary to insure against failure is appointment of "discussion stimulators". They are five or six persons whom the organizing committee knows to be intensely interested in the subject. They are asked to come to the meeting armed with data, opinions on controversial elements and questions aimed at drawing others into the debate. Of course, the moderator is well acquainted with these people, and what each is prepared to contribute, before the meeting—obviously this foreknowledge assists him greatly in conducting the meeting.

The Metallurgical Round Table meetings presented by the Los Angeles Chapter thus far have all produced lively, educational interchanges of information and ideas. Attendance has varied from 35 to 100, depending on the appeal of the subject. Comments from attendees have been highly favorable and those from occasional out-of-town visitors have indicated that they wished such a program was in effect in their chapters. It is our sincere hope that other chapters will initiate similar programs, profiting from the above description, and give their members an opportunity to enjoy and benefit from them as we have.

A list of topics which have been used successfully and a typical agenda follow:

TOPICS

1. Can Tool and Die Steels Be Used Advantageously in Structural Components of Airframes and Missiles?
2. Subzero Properties of Aircraft and Missile Materials.
3. Pressure Vessels.
4. Thermal Treatments of Stainless Steels.
5. Short-Time Properties and Testing at Elevated Temperatures.
6. Thermal Treatments of Medium Alloy Steels to Develop High-Strength Levels.
7. Thermal Protection.
8. Control of Decarburization.
9. Contributions of Metallurgy to Semiconductor Processing Techniques.
10. Ductility Requirements for Structural Applications.
11. Distortion in Heat Treatment, Its Causes and Prevention.
12. Thin Metal Films and Magnetic Materials.
13. Castings for Prime Structural Use.
14. High Energy Rate Forming Effects on Metallurgical Characteristics of Metals.
15. Dimensional Stability of Metals for Electronics Applications.
16. Decarb—Friend or Foe?
17. Fracture Toughness—Resistance to Brittle Fracture in Rocket Motor Cases.
18. Vacuum Melted Steels—Consumable Versus Induction Versus Air Melted Steels.
19. Behavior of Metals at Low Temperatures, Including Cryogenic Problems.
20. Is Normalizing Necessary?

AGENDA

VACUUM MELTED STEELS

1. Cleanliness
   a. Magnaflux
   b. Macro etch
   c. Jernkontoret (JK)
   d. Uniformity
2. Mechanical Properties (Particularly comparison of transverse with longitudinal properties)
   a. Tensile
   b. Yield
   c. Elongation
   d. Reduction of area
   e. Impact
   f. Fatigue
   g. Crack propagation
3. Total Cost Consideration
   a. Material Cost
   b. Scrap at mill and consumer
   c. Forming
   d. Forging
   e. Spinning
   f. Machining
   g. Others

Technical Papers Invited for ASM TRANSACTIONS

The ASM Transactions Committee is now receiving technical papers for consideration for publication in the Society's Transactions. Papers to be considered for publication during 1961 must be received at Metals Park by Apr. 15, 1961.

Many of the papers accepted by the committee will be scheduled for presentation at the 43rd National Metal Congress and Exposition, Cobo Hall, Detroit, Michigan., Oct. 23-27, 1961.

Although papers are considered and acted upon at four quarterly meetings of the Transactions Committee, only those received prior to the Apr. 15 deadline are eligible for publication and presentation this calendar year.

Final consideration of papers for publication and the selection of approved papers for presentation at the 1961 Metal Congress will be made in May 1961.

Manuscripts can be submitted at any time during the year and upon acceptance by the Transactions Committee will be processed immediately for publication in Transactions Quarterly. Printing of a paper does not necessarily infer that it will be presented at the Society's Convention. Transactions Quarterly is available to ASM members at an annual subscription rate of $3.00 (non-member subscription rate $10.00 per year).

Manuscripts in triplicate, plus one set of unmounted original photographs and original tracings should be sent to the attention of T. C. DuMond, Secretary, Transactions Committee, American Society for Metals, Metals Park, Novelty, Ohio.

Prospective authors should send for a copy of the booklet "Suggestions to Authors in the Preparation of Technical Papers". The booklet is particularly helpful in the preparation of line drawings.

Presents $30,500 in College Engineering Scholarships

A total of $30,500 in college scholarships to students in metallurgy and metallurgical engineering will be presented this year by the American Society for Metals' Foundation for Education and Research, according to an announcement by Allan Ray Putnam, managing director.

Equal awards of $500 will be given to metallurgical students at 61 different participating colleges and universities throughout the United States and Canada. Winners are chosen by the schools themselves, and receive a certificate in addition to the cash award.

The ASM Foundation for Education and Research was established in 1953 to recognize outstanding achievement in the study of metallurgical engineering and to encourage more students to enter this important profession. The $750,000 Foundation is the largest ever established by a technical society from its own resources.

Including the 1960-1961 winners, 428 engineering scholarships have been awarded by the 33,000-member Metals Society for a total of $189,200. Walter Crafts, associate director-technology, Union Carbide Metals Co., Niagara Falls, N. Y., and immediate past president of ASM, is president of the Foundation.

Impact Machining Talk Presented at Louisville

The cold extrusion process in which metals through plastic flow are shaped into controlled geometrical shapes was discussed before the **Louisville** Chapter by W. W. Wishart, chief metallurgist, Verson Allsteel Press Co. Cold extrusion, particularly of steels, demands rigid presses and dies. If deflection is not controlled in both press and tooling, fatigue, failure of punch or other components is likely to occur.

Proper lubrication of the steel slug is extremely important to the extrusion process. A zinc phosphate coating is required. This coating, when impregnated with zinc stearate, is able to stand pressure up to 450,000 psi. Coatings up to 3200 mg. per sq.ft. have been used.

Mr. Wishart pointed out that slugs are often coined prior to extrusion so they will fit the diameter or shape of the extruding die. Slugs that are not a close fit in a backward extrusion die sometimes cause eccentricity and punch breakage because of nonconcentric centering or location within the die pot.

The metallurgical aspects of cold extrusion were also discussed by Mr. Wishart. Plain carbon steels up to 0.35% carbon can be extruded. In the lower carbon ranges, lamellar pearlite is used as a beginning structure. However, a spheroidized structure is often required on C1035 material. Silicon, phosphorous, manganese and other ferrite hardeners should be kept low. Stainless steels of the austenitic variety can also be extruded. These are not as workable as C1035 carbon steels. In the nonferrous field, aluminum, copper and low zinc brasses are impact extruded successfully.

The advantages of impact extrusions given by Mr. Wishart include the elimination of machining operations, elimination of waste of raw material, improvement in physical properties due to cold work, controlled grain flow and improved fatigue resistance. In certain parts heat treatment is no longer needed because sufficient strength is imparted to the material through cold work.

Heat Treating Rocket Cases Involves Many Problems

Rocket motor cases 21 ft. tall, 5 ft. in diameter, and as thin as 0.080 in. can be successfully heat treated, but not without giving the heat treater some gray hairs, according to N. O. Kates of the Lindberg Steel Treating Co., who pointed out to members of **San Fernando Valley** Chapter the importance of heat treatment in the fabrication of rocket motor cases. As the motor cases become larger for bigger missiles and the walls become thinner for improved performance, heat treatment becomes of major importance in the reliability of the rocket.

Two of the major problems in heat treating these thin-wall cases are preventing distortion and maintaining the proper chemistry at the surface of the part. Distortion is caused by bending creep, residual stresses, anisotropic growth due to volume changes and differential transformation. Although distortion cannot be eliminated, it can be held to acceptable levels by proper fixturing and heating control.

The surface of the part can be held to close carbon limits by thorough purging and atmosphere control. The missile case, containing some 500 cu.ft. of air must, itself, be purged. Seals are necessary to prevent air from entering the furnace when the load is charged. Control of decarburization and even control to obtain a specified carbon content on the surface is realistically possible.

One furnace used for heat treating these cases is 80 in. in diameter by 288 in. long. It is electrically heated, has five zones of control and operates within the 250-2050°F. range. It is a gantry-type, endothermic atmosphere furnace which rolls on wheels over the pit. The furnace, which is bottom-load quench, straddles the pit which houses the combined atmosphere purge quench, salt quench tank, water wash quench and two pit-type tempering furnaces. *(Reported by E. F. Green).*

Rare Earth Structure Studies Are Reviewed

The present state of knowledge concerning the high-temperature structures of the rare earth metals and a review of noteworthy early work in this field was the subject of a talk at **Los Alamos** by A. H. Daane of Iowa State University.

In reviewing the background of early work, Dr. Daane referred to the work of Klemm and Bommer in the mid-1930's and noted that they produced, by potassium reduction of rare earth chlorides, 14 metals for study. Their data for ten of these metals still hold today except for slight improvements in the precision of the lattice constant measurements. Their work on three rare earths was in error because of a 20% impurity content carried over from the impure starting chloride. Also, they were unable to solve the samarium diffraction pattern correctly.

Also in the mid-1930's an apparent melting temperature in the range of 850-868°C. was determined for neodymium. About 1950, neodymium was heated to 1150°C. to boil off excess calcium and routine time versus temperature data collected on cooling showed not only the previously observed arrest at about 868°C. but also indicated another arrest at a higher temperature. It was then believed that the arrest at 868°C. was a transformation rather than a melting temperature. This observation, together with revisions in the data for other rare earths, pointed out the need for further research on the high-temperature structures of the rare earths.

ASM NATIONAL AND REGIONAL TECHNICAL MEETINGS

Western Metal Congress, Los Angeles, Calif., March 20-24, 1961
Tri-Chapter Conference, Troy, Ohio, Apr. 12, 1961—
Progress in Metal Joining"
Indiana Symposium, Purdue University, W. Lafayette, Ind., Apr. 15, 1961
"Vacuum Metallurgy"
Pacific Northwest Metals and Minerals Conference, Spokane, Wash., Apr. 13-15, 1961
Chicago-Western Seminar, Chicago, Ill., Apr. 20, 1961
"Properties of Metallic Surfaces"
Southern Metals Conference, Atlanta, Ga., Apr. 24-26, 1961
Tri-State Conference, Bethlehem, Pa., May 19, 1961—"Efficiency in Metallurgy—Research, Quality, Control, Production"
National Metal Congress, Detroit, Mich., Oct. 23-27, 1961

More recently, Kenneth Herrmann's attempted use of high-temperature X-ray diffractometry was unsuccessful because of the extreme "gettering" power of rare earths for the residual contaminants in the X-ray camera. James McKeown and John Berg were successful in using a Bunsen ice calorimeter in measuring heat capacities and heats of transformation and fusion of lanthanum, praseodymium and ytterbium, all of which showed allotropic transformations near their melting temperatures. The heat of transformation for ytterbium was found to be about half that observed for lanthanum and praseodymium for the corresponding transformation. This is believed due to the divalency observed in ytterbium as contrasted with the trivalency in lanthanum and praseodymium.

Joseph Hanak observed X-ray evidence for the B-C-C high-temperature forms of lanthanum, cerium, praseodymium, neodymium and ytterbium. By using an electrical resistivity method, he observed, in his resistivity versus temperature curves, discontinuities that indicated the existence of high-temperature modifications for scandium, gadolinium, terbium, dysprosium, holmium and thulium. Recent thermal analyses by Clarence Habermann and Bernard Beaudry have confirmed the high-temperature transformations in scandium, gadolinium and dysprosium. Norman Carlson and co-workers found that the high-temperature B-C-C form of yttrium could be retained to room temperature by quenching yttrium-magnesium alloys.

Daane and co-workers have not found any evidence for a high-temperature transformation in either erbium or lutetium. *(Reported by C. Land and J. Morgan.)*

Continuous Casting Is Key to Inexpensive Steel

Some European steel plants are using a continuous steel casting process to produce a cheap grade of structural steel, according to Neils Engel, School of Chemical Engineering, Georgia Institute of Technology. Dr. Engel visited six European steel plants during the summer of 1960 and spoke about his experience before the **Atlanta** Chapter.

The continuous casting process used by several European plants was developed by Bohler Steelworks, Austria, and Mannesmannwerke, Germany. Molten steel, continually poured into an open-end, water-cooled copper mold, is cooled by contact with the mold walls. The ingot ribbon, while still molten on the inside, is pulled from the bottom by rolls set at suitable speeds. Square ingots with cross sections of 4 x 4 to 10 x 10 in. and flats with cross sections of about 4 x 40 in. are easily made.

The small cross section and fast cooling rate yield a fine-grained ingot with negligible segregation. Controlling the speed of solidification prevents pipe formation. The ingot surface is excellent. Yields from liquid steel to useful ingot or billet is 98% or better because of better steel quality and the elimination of the conventional ingot hot tops. Generally, killed steel can be made with cross sections of about 8 x 8 in. These advantages have a price. Pouring speed and time are limited; ten tons can be poured into a 4 x 4-in. ingot strand in a maximum extended pouring time of one hour. Eight parallel strands are the most which are practical to pour at one time and heats over 80 tons must, therefore, be poured in strands larger than 4 x 4 in.

Starting the casting is the art. Steels will not form a solid bottom plug and must be started with expendable stoppers connected to rods which can be pulled by guide rolls and quickly taken apart after a solid plug has been formed in the mold. Because the present stage of development of this process requires a comparatively large amount of handwork, it takes about the same manpower per ton to produce 4 x 4-in. billets with continuous casting as to produce 4 x 4-in. billets by conventional methods at a production rate of 100,000-150,000 tons per year. Investment costs for the continuous casting process are, however, only about half that for a conventional blooming mill which will produce the same quantity of 4 x 4-in. billets. This is due to the elimination of the blooming mill step in the steel

WIN AWARDS IN ASM METALLOGRAPHIC COMPETITION—*General Electric Materials and Processes Laboratory technicians, Anthony Kapusta, left, and Frank Duci discuss their industrial photographs which recently won medals in the ASM's metallographic contest. The men are shown at a photomicroscope machine, similar to one that photographed the materials. Kapusta photographed an iron-nickel-cobalt mixture, magnified 140,000 times. Duci made a microscopic picture of materials used in diaphram partitions, such as found in turbine-generators.*

producing process.

All steel compositions, except high-speed toolsteels, have been successfully continuously cast. In the production of low-cost structural steel, where quality requirements are less important and where investment in a blooming mill is out of the question, the continuous casting methods may be of interest.

Materials in the Nuclear Age

Because the fuel reserves of coal and oil are being depleted, an alternate source of energy must be found if the United States is to maintain its high standard of living and economic growth. The alternate source, according to William Manly, speaking before the **New York** Chapter, is atomic energy.

Dr. Manly, of the metallurgy division, Oak Ridge National Laboratory (operated by Union Carbide Corp. for the AEC), reviewed the development of nuclear reactors, beginning with the Oak Ridge Graphite Reactor, which went critical in November 1953, and concluding with the newest reactors now being designed. Included in the discussion, in addition to the original graphite reactors, were the Materials Testing Reactor, from which the pressurized water reactors and the boiling water reactors originated, and the gas-cooled reactors.

The latter group, the gas-cooled reactors, originated with the Calder Hall Reactor in England and includes many present-day reactors now being designed and constructed in the United States. Among these are the Experimental Gas-Cooled Reactor, which is under construction at Oak Ridge. This reactor was designed by Kaiser engineers with Allis-Chalmers Manufacturing Co. as the subcontractor. The Oak Ridge National Laboratory participated in the design review and materials development and had responsibility for the design and development of the first fuel loading.

The speaker told his audience that a fuel element for any nuclear reactor must have the following properties: low thermal neutron cross section; strength; corrosion resistance; uniform and controlled distribution of fuel; uniform, reliable bonding between core and cladding; and dimensional stability.

In addition to describing the manner in which various fuel materials could be fabricated into high-temperature fuel elements, Dr. Manly reported a new and interesting development on the coating of individual fuel particles to assist in fission gas retention. The successful utilization of new techniques will be of prime importance in providing a fuel element for the unclad gas-cooled reactors of the future. It is through this type of research that the materials developer will assist in bringing to this country and to the world cheap nuclear power. *(Reported by Harold Schor.)*

VICE-PRESIDENT GREETED IN ROCHESTER—*"Continuous Casting" was the subject of his talk when Carl E. Swartz, ASM Vice-President, appeared before the Rochester Chapter. Dr. Swartz, a metallurgical consultant, has spent many years in research on methods of continuously casting ferrous and nonferrous metals. Shown with Dr. Swartz (left) are Russel Brush, chapter chairman, and Robert Barrow, vice-chairman.*

Production of Corvairs Required Much Coordination

How Chevrolet Motor Division readied itself for production of its Corvair models was described to the **Los Angeles** Chapter by Edward H. Kelley, general manufacturing manager for Chevrolet. He spoke to about 250 members of the Los Angeles Chapter and the Southern California District ASTM.

Kelley, who is responsible for operations at 34 Chevrolet plants across the nation, told how the rear engine design of the Corvair and the widespread use of aluminum in the car presented problems new to the American automotive industry.

Design of an engine utilizing many aluminum castings required the construction of a new aluminum foundry near the St. Lawrence Seaway and Power Authority developments at Massena in Upstate New York, Kelley said. Further, Chevrolet pioneered new concepts of low-pressure, semipermanent mold casting in the new foundry. At Tonawanda, near Buffalo, Chevrolet made extensive changes in its motor plant to machine the aluminum castings and for assembly of the complete Corvair engine.

Kelley credited careful and extensive research, intensive collaboration between engineering and production teams and high organization morale for the fact that the Corvair production assignment was completed on schedule. *(Reported by Eldro M. Woods.)*

Effect of Radiation on Man Discussed in Oregon

Ralph D. Barer, Pacific Naval Laboratory, Esquimalt, B. C., Canada, discussed the effect of radiation on man before the **Oregon** Chapter in Corvallis.

In addition to outlining the biological principles associated with genetics, he described the effect of radiation on man through its effect on the chromosomes and genes.

Radiation can cause chromosome aberrations which result in death of cells, and mutations in genes which have no direct effect on the man physically but do cause physical and/or mental defects in the generations to come. Still births

may be the result of severe mutational damage to the genes.

Genetic damage is both cumulative and permanent. Geneticists consider that a doubling of man's spontaneous mutation rate would be disastrous for the human population. A small percentage increase in the mutation rate can be tolerated, if necessary, but most of this allowance is being used up now by medical radiation.

Radiation exposure of an individual, ignoring the genetic effects, may result in a shortening of the life span by increased aging, by cancers, by reduced resistance to disease. When abnormal radiation, approximately 200 r, occurs, nausea and vomiting will follow within 24 hr. If fatal dosage has been absorbed, nausea and vomiting will occur within the first 2 hr.

Although the dangers from improperly handled radiation sources is great, improved care and understanding is markedly reducing the exposure levels.

Nuclear Metallurgy Defined by Reactor Specialist

Nuclear metallurgy is "the study of the behavior of materials in the nuclear reactor environment", according to Benjamin Lustman, manager of reactor metallurgy, Bettis Atomic Power Laboratory, Westinghouse Electric Corp., who gave a talk before the **Upper Ohio Valley** Chapter on "Application of Materials in Nuclear Reactors".

Continuing, Dr. Lustman said, "The basic engineering and material problem in the application of nuclear energy for power production is the containment of the radioactivity generated directly by the fissioning process and indirectly by the nucleons produced as a result of this process.

"Therefore, the integrity of the materials used to contain the radioactivity produced in the fissioning reaction becomes of primary concern, and it is thus the primary function of nuclear metallurgy to develop materials of adequate capability for such containment", he continued.

Dr. Lustman explained that damage occurs in ductility with an accompanying increase in strength and embrittlement of metals that are exposed to nuclear reactions. Thus, the nuclear metallurgist must design these metals with specifications high enough to withstand many years of use. At the Shippingport plant the clad material used is a zirconium alloy.

The speaker pointed out "the desirability for containing the radioactive products within the fuel itself has led to a relatively new field of study in nuclear metallurgy, namely that of radiation damage of fuels resulting from fission fragment bombardment and fission fragment accumulation within the fuel material itself.

"In addition to the usual conditions of temperatures, stress and corrosion to which materials are subjected in more common applications, nuclear materials must also maintain their intergrity in the presence of intense fields of nuclear particles." *(Reported by Raymond Winter)*

Guenther Honored at Milwaukee

All the silver jubilarians were honored on ASM recognition night at the monthly meeting of the **Milwaukee** Chapter. Awards were presented by ASM President, William A. Pennington, who also was guest speaker for the evening. One member in particular was honored for 25 years of faithful service as the Chapter's secretary-treasurer. Ernest Guenther was presented a silver serving tray from the past chairmen by Merril A. Scheil, National Secretary.

Ernest Guenther

The technical talk of the evening was "Diffusion and Transport of Carbon in Ferrous Metals" presented by William A. Pennington, who, in addition to being ASM's National President, is professor of metallurgy at the University of Maryland. *(Reported by Paul M. Machmeier).*

Honorary Fraternity Adds Ten New Members

At its most recent meeting, the Board of Trustees of Alpha Sigma Mu, honorary metallurgical fraternity, elected ten individuals to membership. Four become honorary members and six regular members.

Elected to honorary membership were:

Professor Eltore A. Peretti, head, Dept. of Metallurgy, Notre Dame University.

Professor Andrew H. Larsen, Dept. of Metallurgy, Missouri School of Mines and Metallurgy.

Professor George A. Fischer, Brooklyn Polytechnic Institute.

Professor Victor Franceschini, Brooklyn Polytechnic Institute.

Six students from the Colorado School of Mines were elected to regular membership. They are: Roger H. Dumm, Allen D. Trujillo, Terry G. Lenz, James L. Sullivan, Jon D. Schieltz and Larry D. Webster.

Copper Alloys Reviewed for "Occasional" Metallurgist

In using copper alloys, the engineer must recognize that improvement in certain physical properties can mean a loss in other properties, R. V. Severson, Ampco Metal Inc., told members of the **Albuquerque** Chapter. His talk was entitled "Copper Alloys for the Occasional Metallurgist".

For this reason, a designer should not confine himself to an investigation of the most used properties but must be concerned with all properties. Full evaluation is necessary to permit selection of a suitable copper alloy which will give maximum desirable properties and minimize the loss of less essential properties.

The principal uses of coppers are made because of their good thermal and electrical properties. Because the addition of alloying elements would adversely affect these properties, additions are restricted to small amounts of chromium, cadmium or beryllium to gain compressive strength.

Brasses are generally used for

ornamental and decorative design, but with some industrial application. The brasses are generally used industrially when a design requires ductility and corrosion resistance.

Copper alloys having the greatest industrial application in engineering design are the bronzes. Many different physical properties can be achieved by the addition of the different alloying elements. This wide variation in properties allows the engineer to select the most suitable bronze applicable to design requirements.

Chapter Co-Sponsors Session on Strength of Materials

"Strength of Materials and Structures" was the subject of a seminar jointly sponsored by the **Peoria** Chapter A.S.M. and the area section of the American Welding Society. The session was held at Bradley University, Peoria.

Participants were:

Elliot S. Nachtman, director of research and development, La Salle Steel Co., speaking on "Strength of Metals".

Jo Dean Morrow, associate professor in theoretical and applied mechanics, University of Illinois, presenting the subject "Strength of Structures".

La Motte Grover, welding engineer, Air Reduction Sales Co., giving the paper "Influence of Design and Material Selection on Costs of Welded Structures". *(Reported by R. C. Dryden.)*

Communications Among Workers Cited as Industry Need

Progress is gained in design and metal processing by good communication among design engineers, metallurgists and all metalworking people in contact with the process or having a hand in manufacturing the product, according to Lloyd O. Gilbert, speaking before the **Rockford** Chapter. Mr. Gilbert, corrosion specialist, Rock Island Arsenal, displayed metal parts with design errors. He demonstrated the reaction of magnesium in wood alcohol in which the metal dissolved in a short period of time. This error in design originated in helicopter fuel tanks made of magnesium and exposed to fuel having parts of alcohol.

Using slides, Mr. Gilbert showed material defects and causes; a common problem in the storage of metal parts is filiform corrosion, with its worm-like tracks caused by temperature and humidity conditions in enclosed areas. The speaker also showed how a painted metal surface is affected by this same corrosion. Another example of corrosion showed how the PH level of coolants affected die cast metals and promoted corrosion. More practical thinking is necessary to solve our problems, says Mr. Gilbert. The use of many new type materials are not always a satisfactory answer to our problems, and the time tested and older materials are becoming more necessary in research and production. *(Reported by G. W. Sandstrom.)*

Case Professor Speaks at Detroit Chapter

"Why Metals Bust" is the intriguing title of a talk presented before the **Detroit** Chapter by William M. Baldwin, Jr., research professor, Case Institute of Technology.

Dr. Baldwin, an authority on cold heading of stainless and carbon steels and resultants of hydrogen embrittlement of steels, spoke on a subject vital to all production men. He discussed the phenomenon of high-speed cold heading of type 302 stainless steel and the resulting strain cracks.

It was stressed that, although stainless steel showed a much higher ductility over carbon steels from tensile tests, the increase in cold heading speeds will drastically increase the embrittlement of stainless over carbon steels. Up to the present time no solution has been found except slowing down the cold heading operation.

On the subject of hydrogen embrittlement, Dr. Baldwin's discussion brought out that there are two types of hydrogen present in iron, the noxious and the innocuous states, one is embrittling and the other is not. It can be made to move from one state to the other and vice versa. For example, hydrogen cathodically charged into Armco iron is embrittling. Baking removes this brittleness, but hydrogen still remains in the iron. It can be shown by austenitizing and quenching of the baked samples that the hydrogen embrittlement returns. *(Reported by William P. Lewis.)*

"Students of the Year"

Four graduates of Metals Engineering Institute, home study division of American Society for Metals, have tied for the second annual "MEI Student of the Year" award, according to Allan Ray Putnam, ASM managing director.

The four were selected over 1632 engineering students from many parts of the United States and Canada for having completed one of ASM's more than 20 home study courses with near-perfect averages. Each will receive his choice of another MEI course, valued at $100 to nonmembers of ASM.

COMPLETE MEI TOOLSTEELS COURSE—*L. S. Starrett personnel who recently completed the MEI Course "Toolsteels" are, from left: W. W. Richards, E. L. Rand, L. H. Norris, E. U. Hause, H. J. Landry, R. L. O'Loughlin, W. F. Noel, R. Blackburn, W. R. Billings, D. W. Minty and instructor R. H. Grace. At the certificate award ceremony students were personally congratulated by Douglas R. Starrett, executive vice-president.*

The 1961 "Students of the Year" are: Melvin Scott, titanium research technician, Republic Steel Corp., Canton, Ohio; Walter P. Wright, laboratory technician, Wisconsin Wire Works, Appleton; R. Grey Raudman, Jr., machinist and clerk, Nibco, Inc., Elkhart, Ind.; and Elmar W. Miskelley, inspector, Granite City Steel, Granite City, Ill.

Now in its fourth year of operation, the ASM Metals Engineering Institute is serving 2500 students from 46 states and 27 foreign countries. An additional 2500 have completed course work.

Students Hear "Metals Can Be Fun"

"Working with metals is so much fun, I've never worked a day in my life", so says Robert B. Pond, professor at Johns Hopkins University. Beginning with this convincing statement, the young guests attending the **Wilmington** Chapter student's night learned how fascinating and rewarding careers in metal science can be.

So vital are metals to our modern society and so diverse and commonplace are the products of metals that the behavior of metals is made known to us in our daily lives. Dr. Pond demonstrated just how true this is in his talk entitled "Fun With Metals".

Dr. Pond asked the students to help him define a metal and then explained to them that their descriptions were in reality the unique and marvelous properties possessed by metals. To further stimulate their interest in metallurgy, the speaker discussed the crystallinity of metals, phase transformations, elastic and plastic behavior and work hardening. Each point was demonstrated with an experiment or analogy to prove to the students that they have already observed these phenomena while working with metals.

If the students were as convinced as the oldsters were that metals can be fun, one or more of them will undoubtedly become metallurgists. *(Reported by G. D. Smith for Tri-City).*

Research Increased on Ductile and Brittle Fracture

Higher strength and reliability requirements have intensified the research on the problem of fracture. Current evidence is that both "ductile" and "brittle" fractures of metals nucleate at the atomic level, according to George M. Sinclair, professor, College of Engineering, University of Illinois, speaking before the **Tri-City** Chapter.

Research indicates that engineering variables of importance in fracture of metals include chemical composition, microstructure, state and magnitude of stress, temperature, strain rate and physical geometry of the actual piece under investigation.

All metals show an increase in yield with decreasing temperature. The amount of change in yield strength varies with the metal being tested. In some metals the change is gradual and has a relatively insignificant influence on fracture behavior. Other metals, mild steel as an example, show a large change in yield in temperature, leading to an abrupt ductile-brittle transition in fracture behavior.

Microcrack lengths necessary for fracture are inversely proportional to the square root of the crack length. Detection of cracks in materials is being studied in order to reduce the catastrophic failures of high strength, low-weight aircraft and missile components.

Traces History and Uses of Electron Microscopy

Although it was shown that an electron stream could be deflected by an electrostatic field in the early 1900's, it wasn't until 1924, when the wave nature of electrons was recognized, that the concept of an electron microscope was considered practicable, according to Richard P. Sernka, senior research metallurgist, Aeronutronic Div., Ford Motor Co., who spoke on the subject "The Electron Microscope as a Metallurgical Research Tool" before the **San Fernando Valley** Chapter.

The electron microscope can be considered as being comprised of four areas: the illuminating or electron source; lens system; vacuum system; and photographic system.

Sample preparation is the most important phase of electron microscopy contributing to the quality of micrographs. Metallic microstructure can best be examined by use of a shadowed, cast or vapor deposited replica technique. Satisfactory replicas must meet four requirements—give a faithful surface reproduction; be strong enough; be thin enough; and be stable in a vacuum.

Many variations in replica techniques and handling are possible. Recent work toward making ultrathin metal foils for use with direct transmission electron microscopy has been successful. Substructural dislocation density and morphology can be observed. *(Reported by E. F. Green.)*

ASM PRESIDENT VISITS INDIANAPOLIS—*On one of the first of many chapter visits during his term of office, ASM President William A. Pennington appeared before the Indianapolis Chapter. Accompanying Dr. Pennington on this visit was Allan Ray Putnam, ASM managing director. Shown (from left) are Charles C. Patton, past chairman, Dr. Pennington, Mr. Putnam, George Sommer, chairman, and George J. Shubat, technical chairman. Dr. Pennington spoke on "Diffusion and Transport of Carbon in Ferrous Metals".*

METAL PROGRESS EDITOR SPEAKS—*Shown here (second from right) as guest of the Peoria Chapter is Allen G. Gray, editor of* Metal Progress. *Speaking on "The Metals Technology of the Sixties", Dr. Gray reported that U.S. Government agencies will spend up to 50 billion dollars on space projects in the 1960's. As its part in this program the metals industry must think of operational temperatures up to 5000°F. or more and lows approaching absolute zero. The ability to withstand fuel combustion temperatures up to 10,000°F. is another possible requirement. Peoria Chapter officers shown with Dr. Gray are (left to right) C. S. Black, chairman, Charles Dancey, editor, Peoria Journal Star, D. J. Wright, technical chairman. On other recent trips Dr. Gray also presented his talk before the Golden Gate, Santa Clara Valley and Sacramento Valley Chapters.*

Canadian Defense Official Discusses Materials Research

Harold Oatway, head of the Aeronautical Engineering Section, Defence Research Board, Ottawa, spoke on "Defense Interests in Materials Research" at **Ottawa Valley.** He explained that the Defence Research Board, as an instrument of the Defence Dept., is one of several government agencies in Canada which are active in research.

The most active channel for materials research through the Defence Research Board is the grants-in-aid of research to university staffs. However, the funds available for such programs are part of government appropriations for national defense and in these days of shrinking defense budgets this support is limited.

Particularly in Canada, the formulation of research requirements predicated on defense development programs has been a sporadic affair and has not provided a stable base for long-term research projects. Therefore, to show the direction in which research studies will best serve future defense needs, analysis of stated and anticipated military requirements is necessary.

Looking afield to aeronautical requirements, for instance, it is possible to foresee within the next decade in Canada the application of the gas turbine power plant to naval and land vehicle propulsion systems. The high temperatures that will be encountered must be alleviated or withstood by means of cunning structural design or by choice of high heat resistant materials. Temperature therefore is one criteria for research requirements. However, while emphasis on heat resistant capabilities might lead merely to the use of higher density materials, so due emphasis must also be given to better payload/structural weight ratios, to improved ease and reliability of fabrication and also to domestic availability.

The Navy and Army are also concerned with advances in material sciences. The need for bulk and weight reductions, accompanied by increased strength and wearability, is a typical service requirement. If submarines, for instance, are to increase their depth of operation there must be materials which will give greater strength/weight ratios.

Priority for research projects by the Defense Dept. is more likely to be obtained for the more speculative or exploratory-type projects. A more exciting and stimulating approach, however, is to consider advances in materials research which could lead to quite radical design.

Mr. Oatway stated that research should be considered in relation to the National economy. The Canadian economy has traditionally been based on primary industries but this export market is nearing its end; we must now exploit secondary industries. This will require a prior acceptance by the public of the principle of defense spending as an indirect support of research in industry. (*Reported by C. Dixon.*)

STUDENT OFFICERS SURROUND SPEAKER—*Surrounding O. T. Barnett, Armour Research Foundation, who spoke to their group on "The Role of the Metallurgical Engineer in Research" are officers of the Metals Club of Illinois Institute of Technology. Shown from the left are: L. F. Mondolfo, faculty advisor, R. W. Lobenhofer, president, J. B. Schneider, secretary, F. S. Gezella, vice-president, and F. M. D'Alessandro, treasurer. Mr. Barnett's talk was the second of a series by representatives from various branches of the metallurgical profession discussing the role of metallurgical engineers in the different branches.*

Aluminum Has Long History in Auto Engines

Aluminum automotive engines now much in the news really date back to 1917 when the first V-8 engine was built, according to Richard M. Smith, Aluminum Co. of America, in his talk "Aluminum and the Automotive Industry" before the **Saginaw Valley** Chapter.

Several problems had to be overcome before mass production of aluminum automotive engines could become a reality. The first of these was the lack of volume supply of the basic metal which has now been solved. The second concerned main bearing clearances which were solved by compromise and properly selected engine designs.

The two casting methods currently used to produce aluminum automotive engines are permanent mold and die casting. For a casting weight of 45-50 lb., the permanent mold process could result in 6-8 casts per hour per mold, while the die casting process might produce 25-28 castings per hour per machine. It was pointed out, however, that with a die casting design utilizing all possible cored-out areas the "down time" might run as high as 30%.

Metal handling techniques and clean metal are important in both casting processes.

The problem of cast-in ferrous cylinder liners was next discussed and the reasons for designing for either "wet" or "dry" liners. A "wet" liner is one which is cast into the aluminum block at the lower end and, thereby, wet by the engine coolant for its entire length. A "dry" liner is completely surrounded by the aluminum casting and not contacted by the engine coolant. Metal flow around the liner during the casting process determines type of liner design selected. The "wet liner" type of construction can be produced in either the die cast or permanent mold processes. However, the "dry liner" application is more suitable to the die casting process. The outer "dry liner" surface in the die cast process was described as a "rough cast pipe" surface and for permanent mold as a "round thread" surface.

Mr. Smith gave his audience a good look into the problem of wear resistant aluminum alloys in aluminum engines. It has been proved that the addition of silicon to aluminum alloys increased their wear resistance. Aluminum cylinder liners made from alloys containing up to 50% silicon have been tested experimentally using the "cold start engine test". During cold starts, gasoline washes lubrication from the cylinder bore and scuffing and/or scoring results between the aluminum piston skirt and aluminum alloy cylinder bore. A coating is required on piston or cylinder bore, in this combination, to provide compatibility when lubrication is lacking. Aluminum alloy cylinder bores sprayed with about 0.004 in. thick coating of molybdenum gave excellent results when tested with conventional aluminum alloy pistons. Engine tests at 9:1 compression ratio showed interesting results with aluminum pistons sprayed with molybdenum 0.001-0.002 in. thick on the skirts operating in a 17-20% silicon bore coated with lead. *(Reported by Paul J. Landgraf.)*

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Advantages of Cast Steel

Cast steel has too long been neglected as a misunderstood stepchild, Jules J. Henry, director, product and development, Missouri Steel Castings Co., told members of **Rocky Mountain** Chapter. Briefly stated, cast steel enjoys the advantages of an elastic modulus of around 30 million, twice that of cast iron, and an ultimate strength much higher than the various common cast irons. The high elastic modulus causes a slender piece to deform less under load than does material of lesser modulus.

Being a casting it is amenable to advantageous redesign in experienced hands so that excess metal can be much reduced. Thus, odd-shaped parts, carrying high loads, and previously made by welding more or less standard shapes into a conglomerate mess, are more rapidly and less expensively formed by casting.

It must not be inferred, the speaker said, that cast steel can replace cast iron or forgings of sundry metals which have specific properties useful to unique applications, but it should be kept in mind that the physical properties of cast steel are not directional in character. *(Reported by Walter B. Leaf).*

Aircraft Industry Leads Demand for Strong Steels

The aircraft industry has shown need for high-strength formable stock since the close of World War II, according to Adolph J. Lena, manager, Basic Research Dept., Allegheny Ludlum Steel Corp., speaking before the **Canton-Massilon** Chapter. Primary considerations include the load-carrying ability of the material in elevated temperature performance up to 2000°F. induced by aerodynamic heating in high speed flight. The operating temperature range of competitive alloys at various flight speeds were reported:

Temperature Range	*Alloy*
Room temperature to 350°F.	Al alloys
350-1000°F.	Ti Stainless Toolsteel
1000-1600°F.	Super alloys
Greater than 1600°F.	Super alloys Refractories Ceramics

Advantages and disadvantages of various types of steel, designed for elevated temperature application, were discussed:

(a) Hot work die toolsteel: H-11 and Potomac M. Toolsteels offer the best strength-to-weight ratio at temperatures up to 1200°F. but are poor with respect to formability and corrosion resistance. Capable of 280,000 to 300,000 UTS.

(b) Austenitic stainless steels: T201 and T301. Offer formability, corrosion and oxidation resistance. Tensile strengths in excess of 185,000 psi. can be obtained with good yield strength and ductility through cold working.

(c) Martensitic hardenable stainless steel: T-149 and T-420. These grades show limited formability and are subject to scaling and distortion in forming and stress corrosion cracking in service. Offers 200,000 UTS up to 800°F.

(d) Precipitation hardenable stainless steel: AM-350 and AM-355. Offers strengths at 200,000 UTS level with good corrosion resistance, weldability and formability.
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CHAPTER MEETING CALENDAR

Albuquerque	**Mar. 16**	Hotts Dinner Bell Restaurant	**Harrison Dixon**	High-Temperature Alloy Casting
Atlanta	**Mar. 13**		**Panel**	Nonferrous Metals
Baltimore	**Mar. 20**		**A. E. Nihrenberg**	Recent Advances in Cutting Tools and High-Temperature Bearing Steels
Birmingham	**Mar. 7**		**Dr. Bates**	Materials Requirements in the North American Economy—1975
Buffalo	**Mar. 9**		**G. E. Stein**	Influence of Casting Variables on the Structure and Properties of Al Casting Alloys
Calumet	**Mar. 14**	Phil Smidt Restaurant	**Alvin Shames**	New Products—Life Block of Your Country
Carolinas	**Mar. 16**	Pinebrook Country Club	**L. P. Tarasov**	Grinding Research and Its Applications
Cedar Rapids	**Mar. 13**	Roosevelt Hotel		Hard Soldering
Chicago	**Mar. 13**	Furniture Club	**G. K. Manning**	Practical Aspects of Hardenability
Chicago-Western	**Mar. 20**	Old Spinning Wheel	**T. J. Dolan**	Relationship of Design and Materials to Fatigue
Cincinnati	**Mar. 9**	Engineering Society	**Louis Zernow**	Principles of Explosive Forming
Cleveland	**Mar. 6**			New Developments in Powdered Metallurgy
Columbia Basin	**Mar. 15**		**W. A. Pennington**	Mild Steel in Corrosion Service
Columbus	**Mar. 1**	Desert Inn	**H. L. Yochum**	
Dayton	**Mar. 8**	Engineers Club	**J. Livingston**	Dislocations in Metals
Delaware Valley	**Mar. 15**	Hotel Stacey	**F. G. Tatnall**	Engineering and Metallurgy
Detroit	**Mar. 13**		**Robert B. Allured**	Materials Defects—How to Find Them by Nondestructive Methods
Eastern New York	**Mar. 14**		**V. C. Wilson**	Energy Conversion Methods
Fort Wayne	**Mar. 13**		**R. F. Thomson**	Are Metallurgists Prepared for 19xx?
Hartford	**Mar. 14**	Indian Hill Country Club	**N. Bredzs**	Interesting New Developments in Brazing
Kansas City	**Mar. 15**	Golden Ox Restaurant	**John Pearson**	Explosive Working of Metals
Lehigh Valley	**Mar. 3**	Hotel Traylor	**J. D. Graham**	Field Failures
Los Angeles	**Mar. 16**	Rodger Young Auditorium	**W. A. Pennington**	Diffusion and Transport of Carbon in Ferrous Metals
Mahoning Valley	**Mar. 14**	Mural Room	**Paul E. Moore**	Nonaging Sheet Steel
Milwaukee	**Mar. 14**	Astor Hotel	**Irwin H. Such**	Taking a Second Look at the Soaring 60's
Mohawk Valley	**Mar. 6**		**John C. Fischer**	World Effort in Materials Research
Montreal	**Mar. 13**	Queen Elizabeth Hotel	**T. H. Rogers**	Use of Nonferrous Metals and Alloys in Sea Water
Muncie	**Mar. 14**		**Walter E. Jones**	Vacuum Melting
New Hampshire	**Mar. 10**		**Lester Sheehan**	Standard Steel Programs
New Jersey	**Mar. 20**	Essex House	**R. S. Day**	Temperature Control Systems
New York	**Mar. 13**	Brass Rail Restaurant	**Anthony Barrett**	Project Mercury (Man's Problems With Metals in Space)
North Texas	**Mar. 2**		**Frank Tatnall**	Philosophy of Measurement
Northeast Pennsylvania	**Mar. 9**		**E. F. Nippes**	Weld Heat Affected Zone
Notre Dame	**Mar. 8**		**A. N. Holden**	Radiation Damage to Metals
Oak Ridge	**Mar. 15**	Holiday Inn	**R. G. Berggren**	Record Studies on Brittle Fracture
Ontario	**Mar. 3**	King Edward Hotel		Ladies Night
Oregon	**Mar. 10**	Congress Hotel	**W. A. Pennington**	National Officers Night
Ottawa Valley	**Mar. 7**	Charles Camsell Hall	**R. W. Guard**	Diamonds and Super-Pressure Technology
Peoria	**Mar. 13**	Vonachens Junction	**M. C. Metzger**	Materials for Gas Turbine Applications
Philadelphia	**Mar. 31**	Franklin Institute	**Clarence G. Bieber**	Creative Metallurgy
Phoenix	**Mar. 28**		**R. J. Raudebaugh**	National Officers Night
Pittsburgh	**Mar. 9**	Gateway Plaza	**John Stack**	Prospects and Problems for the Supersonic Commercial Air Transport
Purdue	**Mar. 21**	Holiday Inn	**L. F. Coffin Jr.**	Recent Developments in the Fatigue of Metals
Richmond	**Mar. 14**	Executive Motor Hotel	**W. S. Pellini**	Thermostructural Problems of Missiles, Rockets and Space Vehicles
Rochester	**Mar. 13**		**David J. Mack**	Metallurgical Folklore
Rocky Mountain	**Mar. 17**	Oxford Hotel	**Albert G. Zima**	Nickel—a Versatile Metal
St. Louis	**Mar. 16**	Clayton Elks Club		Space Capsule
San Fernando Valley	**Mar. 28**	Glen Aire Country Club	**R. W. Guard**	Man-Made Diamonds in Industry
Southeast Ohio	**Mar. 2**	Berwick Hotel	**Mars G. Fontana**	Some Unusual Corrosion Problems
Springfield	**Mar. 20**			Numerical Tape Control
Syracuse	**Mar. 7**	Onondaga Hotel	**Norman Zlatin**	Developments in Metal Removal
Toledo	**Mar. 9**	Maumee River Yacht Club	**Mars G. Fontana**	Corrosion Problems
Tri-City	**Mar. 14**		**H. R. Clauser**	Reducing Materials Cost by Proper Metal Selection
Tulsa	**Mar. 7**		**H. W. Butterbaugh**	Copper—Past, Present and Future
Upper Ohio Valley	**Mar. 8**		**Anton Brasunas**	Education for a Career in Metallurgy
Washington	**Mar. 13**	Amer. Assoc. Univ. Women's Club	**Dwight Brown**	Direct Reduction of Iron Ore
West Central Florida	**Mar. 13**		**W. C. Miller**	Investment Castings
Wichita	**Mar. 29**		**W. A. Pennington**	Diffusion and Transport of Carbon in Ferrous Metals
Wilmington	**Mar. 8**	Fabians Restaurant	**R. D. Stout**	Brittle Fracture
York	**Mar. 8**		**J. D. Dunlap and O. E. Cullen**	Control Modes and Gas Atmosphere and Applications Since World War II

Low-Temperature Studies Reveal Interesting Data

The testing of materials at cryogenic temperatures allows one to observe the activity—or lack of it—in processes during plastic deformation while in the absence of complicating thermally activated phenomena, according to Maxwell Gensamer, professor of metallurgy, Columbia University, speaking before the **Long Island** Chapter.

One interesting observation disclosed that the strain hardening effect in iron changed as temperatures were lowered until a linear type of relationship was approached.

When testing at extreme low temperatures, such as 4° K., a saw-tooth effect has been observed by many investigators. Dr. Gensamer explained this behavior on the basis of "adiabatic bursts", that is, the small amount of heat produced by the onset of plastic deformation causes the specimen temperature to rise adiabatically. In effect then, the test at 4° K. becomes, after the start of plastic deformation, a test that oscillates between 4° K. and some higher temperature (say 25° K.) which causes the strength differences to be noted in the stress-strain curve as a saw-tooth.

The effects of grain size and alloy additions on the cryogenic properties of iron were also discussed. Dr. Gensamer pointed out that while small amounts (3-4%) of nickel produced a material with increased fracture stress, decreased yield strength and greater ductility at low temperatures, the addition of chromium increased the yield strength while lowering the ultimate strength and ductility at these same low temperatures.

In testing at low temperatures, many types and sizes of specimens can be employed. For the ship plate steels discussed, all of the specimen sizes and configurations indicated a ductile-to-brittle transition temperature. The transition was definitely shown to exist but the temperature of its occurrence for any one steel was changed dependent on the specimen used. In general, the larger the specimen size, the higher the transition temperature was found to be. The variation in ductile-to-brittle transition temperature was found to be quite large, and for one grade of steel was shown to be above 100° F. when tested as a large simulated hatch cover, but was shown to be below 0° F. when tested as a notched tensile specimen.

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Owens-Illinois Technical Center, Toledo, Ohio, is interested in two metallurgists, materials engineering, one man with three to five years experience, top-notch. Salary open. Call R. Richards, Chief Metallurgist at CHerry 2-6543, Toledo.

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ASM members, we predict, will be proud of their Society and its capacity for assembling vital technical information when they unwrap (literally "unbox") their copies of Volume I, Eighth Edition, of the Metals Handbook. Titled "The Properties and Selection of Metals". This 1300-page work is the fruit of five years of intensive effort on the part of ASM Handbook Committee and Author-Committee members, as well as a thoroughly devoted Handbook staff. About 1300 persons participated in preparation of material for the Handbook, and it is the contribution of those persons in industry, education and government that is bringing to print for the first time much data that have not been previously available.

"The ever-increasing changes and complexities that characterize present-day world economic and political conditions have forced a growing demand for usable technical information about metals", writes Dr. William A. Pennington, ASM President, in the foreword of this new volume. "Such a demand presents a strong challenge to the American Society for Metals in its role of disseminator of metals information.

"The appearance of this book", adds Dr. Pennington, "is a formidable response by ASM to that challenge".

Printing of the new Handbook is now complete. The lengthy process of binding the press run of 40,000 copies is now under way, and mailings are being made to the membership as fast as binding is being completed. Some members have their copies now, the bulk of the mailing will be done in February, and the remainder finished in March.

Regular members of record as of Dec. 31, 1960, are receiving a copy of the Handbook without additional charge. This includes regular and sustaining members. Members who have joined the Society after Dec. 31 may order a copy of the Handbook for $10. Student members, who have never received copies of any editions of the Handbook without charge, may purchase a copy at $6.50. Additional copies of the Handbook may be bought by members and student members at the regular price of $30.

Toting up the figures of what this Handbook has cost in dollars gives an even more understandable standard of measurement of the value of the content. Direct expenditure by the Society itself on this major educational undertaking has exceeded $525,000. Coupled with this is the time and expense of people from industry conservatively estimated at $600,000. Thus, the appellation "million-dollar Handbook" is earned, and then some.

The Society's Handbook Committee has been chaired for the past six years by N. E. Promisel, Bureau of Naval Weapons, Navy Dept. "Nate", as he is known by his friends and associates, has the wonderful ability to guide a committee in examining the knottiest problems with apparent ease, never losing a puff on his pipe in the process. His leadership inspires confidence and loyalty of all those who work with him. The names of the members of the Handbook Committee are listed in the volume.

Editor of the Handbook, Dr. Taylor Lyman, is now taking his first vacation since 1956, and it is well deserved. The coordination of the 83 author committees; the gathering of the basic material, much of it raw data; the intensive working with authors and reviewers; the editing and re-editing of the copy; the preparation of the 6700 drawings and other illustrations; the compilation of 1800 tables; the final tedious yet intriguing process of following the book through its final production stages—all of these were the task of Taylor Lyman and his devoted staff.

Yet I am certain that both Nate Promisel and Taylor Lyman agree that the Author Committees, again all of whom are listed in the Handbook, have been very much the key to bringing together the material that makes the Handbook what it is. Their diligent search for information has yielded rich finds of data. Evaluation of such material and the review of the manuscript by these Committees have assured the ASM member a reliable, factual, genuinely usable reference book that he will wish to keep ever at hand whenever he is concerned with the properties and selection of metals.

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METALLURGICAL CHEMIST: Over 20 years in metals. Analysis and quality control of ferrous, nonferrous, refractory, precious, metal byproducts, ores, compounds; scrap metal identification, reclamation and sorting; research and development in process metallurgy; patent and report writing; customer relationships; experienced supervisor; good background in nonferrous smelting and powder metallurgy techniques. Box 2-80.

METALLURGICAL TECHNICIAN: Age 31, married, four children. Ten years experience in research and development, primarily in the consolidation and fabrication of refractory metals. Additional experience in the field of ferro-alloys, powder metallurgy, ceramics, corrosion and metallography. Résumé on request. Box 2-85.

METALLURGICAL ENGINEER: B.S. degree, age 34, married. Foundry research in United Kingdom (two years); production supervisor in copper and silver refineries in South America (three years) and Canada (three years). Past four years in development of refractory metals (particularly columbium) in U.S. Desires responsible position in development or production, U.S. or abroad. Box 2-90.

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